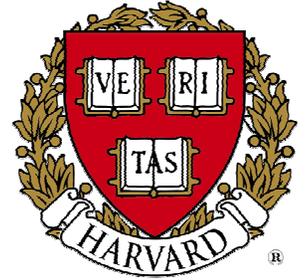




Significant in-medium η' mass reduction in $\sqrt{s_{nn}} = 200$ GeV Au+Au collisions



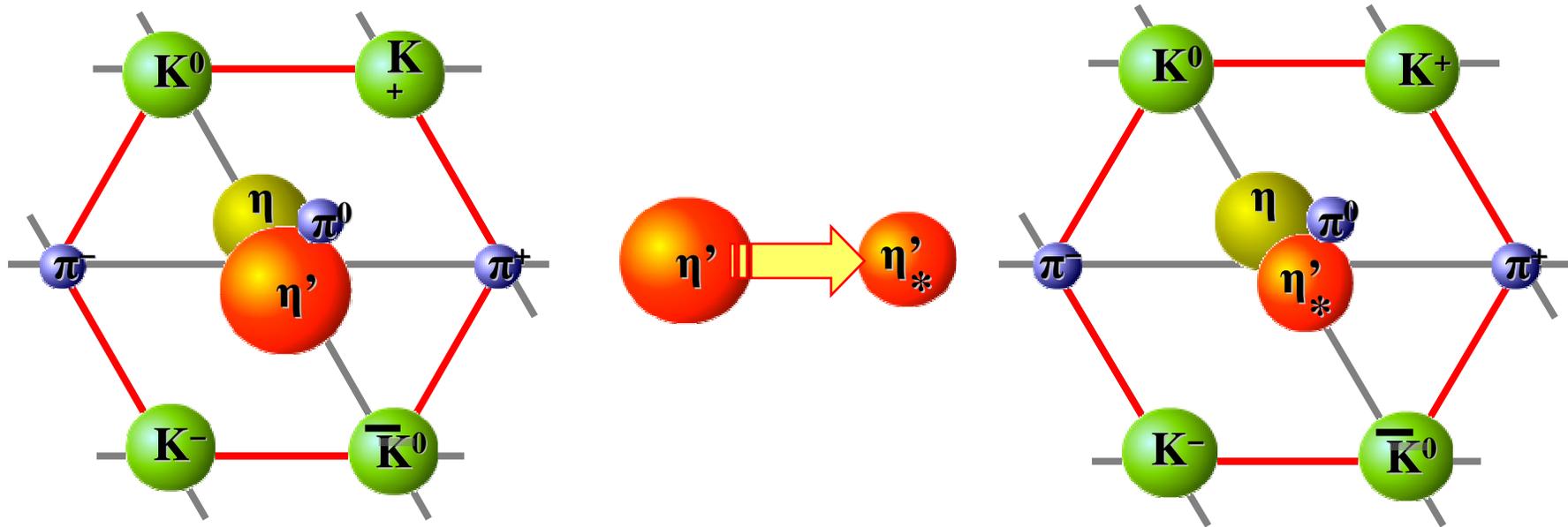
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Poster **615**

http://www.rmki.kfki.hu/~vertesi/etap_bec

Motivation

- Approximate SU(3) symmetry

Spontaneous symmetry breaking \rightarrow 9 Goldstone bosons

$U_A(1)$ -breaking terms \rightarrow η' gains extra mass

Refs: T. Kunihiro, Phys.Rev.Lett. **B218** 363 (1989)

J.Kapusta, D.Kharzeev, L.McLerran, Phys.Rev. **D53** 5028 (1996)

Z.Huang, X.-N. Wang, Phys.Rev. **D53** 5034 (1996)

In hot medium, η' mass reduced to quark model mass

- Signal: Enhanced η' production at low p_T

$$\frac{N_{\eta'}^*}{N_{\eta'}} = \left(\frac{m_{\eta'}^*}{m_{\eta'}} \right)^\alpha e^{-\left(\frac{m_{\eta'}^* - m_{\eta'}}{T} \right)}$$

- Observation channel: pion BEC

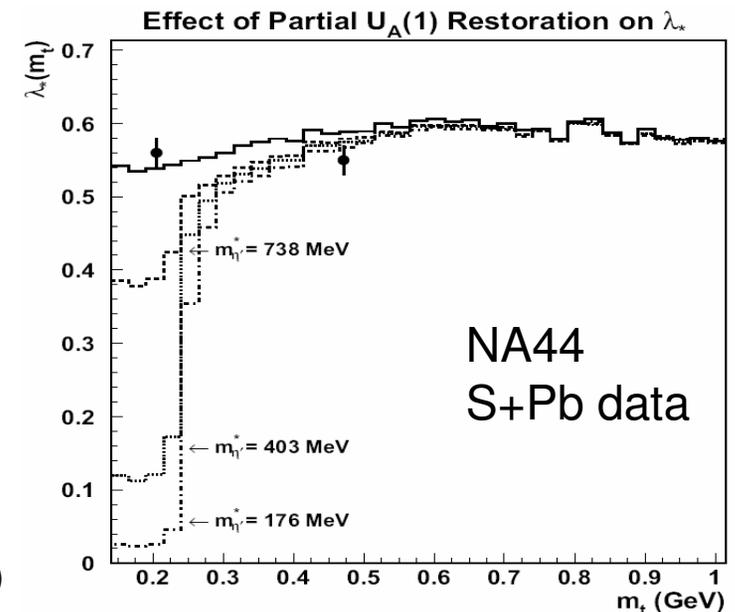
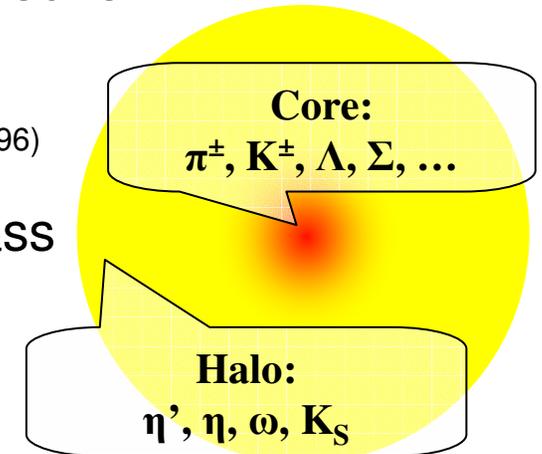
η' has long lifetime, decays into pions

Core-halo picture: more η' 's enhance halo

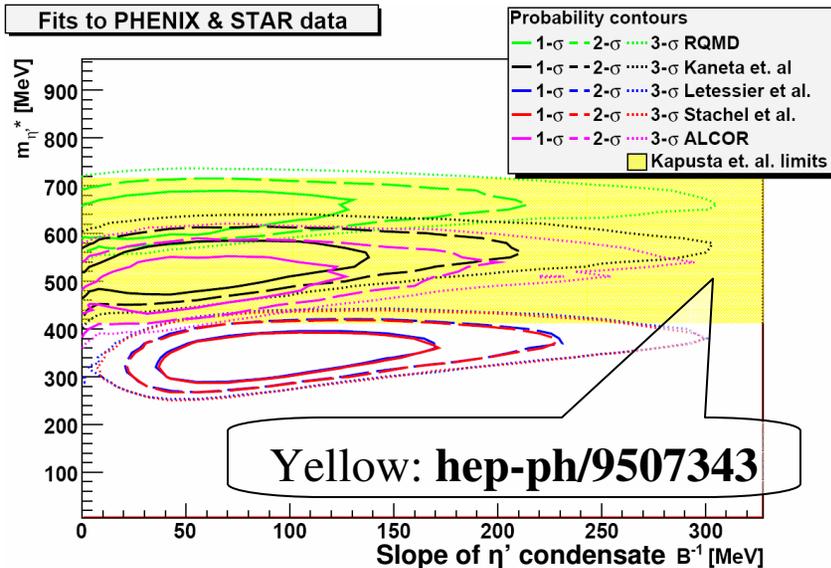
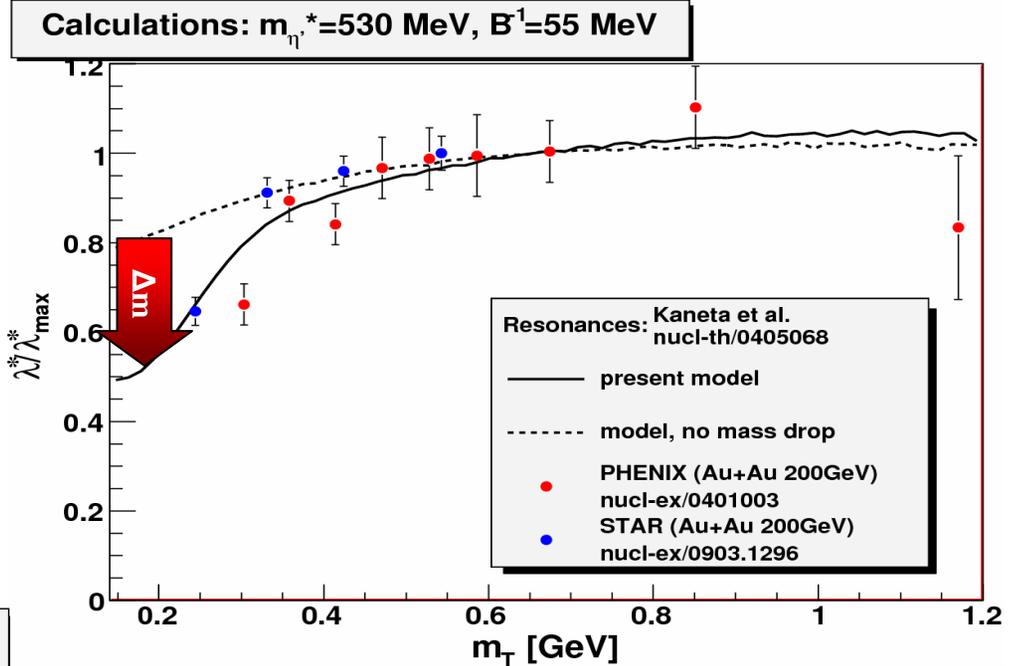
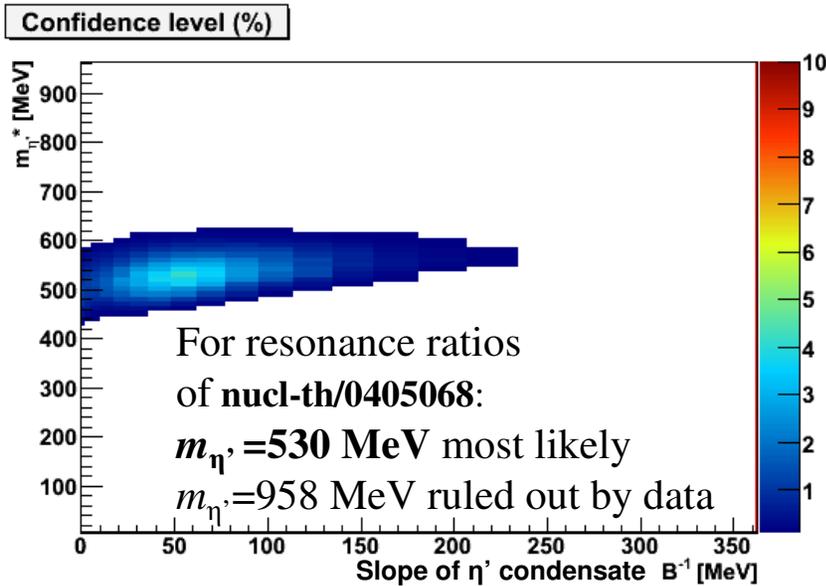
Measurable through the parameter λ^*

$$\lambda^* = \left(\frac{N_{\text{core}}^{\pi^+}}{N_{\text{halo}}^{\pi^+} + N_{\text{core}}^{\pi^+}} \right)^2$$

Ref: Vance, Csörgő, Kharzeev, Phys. Rev. Lett. **81** 2205 (1998)



Simulation and Results

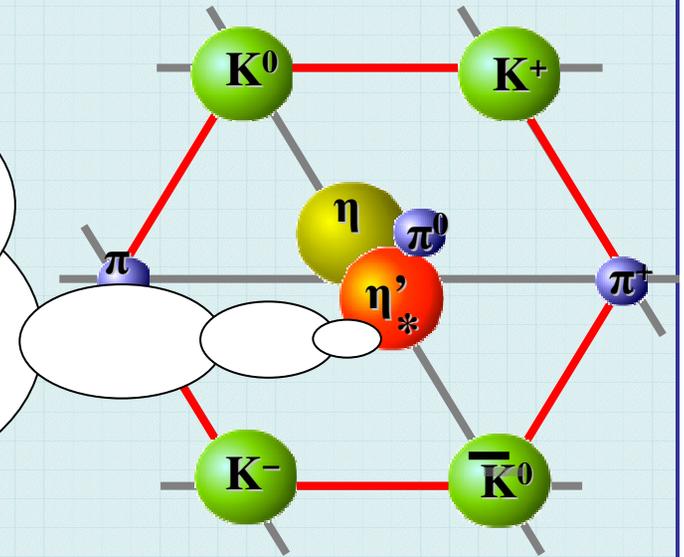


- 6 models for the particle ratios
- (ALCOR, FRITIOF, Letessier et.al., Kaneta et.al., RQMD, Stachel et.al.)
- Resonance decays: JETSET
- Systematic studies for freezeout parameters and prefactors

Conclusion

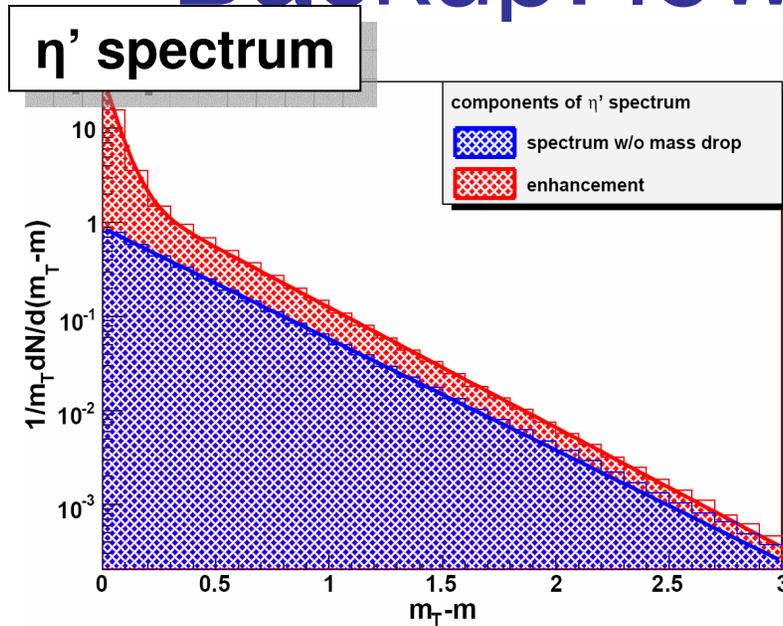
$m_{\eta'}^* < m_{\eta'} - 200 \text{ MeV}$
at the 99.9% confidence level

from PHENIX+STAR $\pi^+\pi^+$
correlation data + 6 models



- Cross-check with dilepton spectrum needed
- More λ^* data at low p_T is needed to reduce systematics
- Revitalize interest in chiral symmetry restoration

Backup: low p_T and dileptons



- Resonance ratios:
nucl-th/0405068
 - Enhancement factor ~ 24
 - Breaks m_T scaling for η'

- **Excess at $m_{ee} < 1$ GeV**
- Seen at SPS (CERES) and RHIC (PHENIX)
- Only in A+B reactions
- Absent in p+p
- **Possible explanation: η' enhancement**

